

**Army AL&T Magazine Article, March-April 2004 Issue**

**FUTURE TACTICAL TRUCK SYSTEMS-MANEUVER  
SUSTAINMENT VEHICLE (FTTS-MSV)  
PIT STOP DESIGN WORKSHOP**

*The FTTS is the Combat Service Support (CSS) tactical vehicle vision to support Future Combat Systems (FCS) as a member of the Unit of Action (UoA).*

*Derived from a system used to improve vehicle performance during auto racing, Pit Stop Design is an innovative, approach to advancing military vehicle systems. When it is employed in the design of a system concept, the end product is a concept that exceeds user requirements and is easily operable and maintainable.*

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Roger K. Halle and Steven J. Kramer

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One of the Army's strengths lies in its ability to leverage innovative ideas from businesses, and not just from the defense industry. One source that we can learn from is the world of automobile racing. Every competitive racing team invests much effort into designing and optimizing the pit stop in an effort to ensure victory. A pit stop is characterized by several attributes. It is rapid, well choreographed, uses the minimum number of tools, and interacts with a system designed to be maintained and supported in a minimum of time.

So where is the lesson in this for the Army? The Advanced Concept Process is a long-standing approach to vehicle concept design. It is typically used for concept

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studies that focus their efforts on defining and evaluating the feasibility of alternative concepts. This is done by identifying, analyzing, and allocating mission-level User requirements and needs. These provide a basis for assessing the advantages, disadvantages, and degree-of-risk for each concept.

"Pit Stop Design" process is another "tool" in the concept development process to help optimize the process in order to facilitate the specific needs of a particular concept design study. The "Pit Stop Design" process was developed by Dennis Carlson of Carlson Technology Incorporated. The process provides for the collaborative development of a vehicle design through the use of 1/6th scale models. The "Pit Stop Design" process begins with the construction of a 1/6th scale physical replica of the "current" concept design vehicle and all of its major components. A design study team comprised of experts from the User, Developer and Program Management communities works together to efficiently package the components with the vehicle crew as the centerpiece. This creates an environment for give-and-take among Users and Developers in which objective, rational trade-offs can be made, with the repairability and maintainability of the vehicle a prime consideration. Other benefits for the vehicle concept design that come out of this environment include:

- Soldier first design approach
- Reduction in overall integration risk
- Requirements trade-off assessment
- Lower weight and volume

- Reduction In total ownership cost
- Increased reliability
- Enhanced human/system interface
- Maximized commonality
- Improved producibility
- Aid to future upgrades
- Reduced logistics burden and cost
- Significant reduction in production time, complexity and cost
- Reduction in time and personnel throughout system life cycle

This process like the automobile racing pit stop, provides a forum that allows rapid interchange of design ideas, applies techniques to achieve results, utilizes actual scale model components as tools, integrates with the Advanced Collaborative Environment and requires the interaction of the User and Developer communities to achieve the goal of providing input into the emerging requirements as well as the vehicle design. By combining the “hands on” physical model as well as the electronic “virtual” models, the ability to collaborate and understand the emerging concept design is understood by all parties.

On 16-17 September 2003, TARDEC’s Advanced Concepts Team hosted a Pit Stop Design Workshop for the Future Tactical Truck Systems (FTTS). A diverse team from the User, Developer, and Program Management communities collaborated to refine the Maneuver Sustainment Vehicle (FTTS-MSV) concept

using the Pit Stop approach. The process was supplemented with the use of Advanced Collaborative Environment (ACE) tools such as ProEngineer, ProductView and ProjectLink. By utilizing modeling and simulation tools and technology coupled with the Pit Stop Design methodology, subject matter experts do not have to wait for hardware to take an active role in development. They can participate directly in system design reviews to ensure vehicle function and supportability from the outset. Everyone involved takes a direct, active role in fielding a quality system, thereby maximizing operational effectiveness. Participants form conclusions more quickly, clearly pinpointing issues that should be resolved before production and fielding. This results in shorter development timelines and reduced life-cycle cost.

The resulting FTTS-MSV concept offered several innovations including an FCS Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) integration approach that will be incorporated in subsequent FTTS concepts, to make the system a “node” on the FCS network to be a true enabler to the Unit of Action concept. Pit Stop Design provided a common understanding of the design, use and challenges of the FTTS-MSV. The refined concept design featured a repackaged engine cooling and exhaust system for signature reduction, integrated water generation and stowage for the Unit of Action, and provided access to components for maintainability. As well as having the same C4ISR capabilities as all the other FCS variants, the FTTS-MSV will have the survivability and mobility characteristics to keep pace with and

therefore provide adequate support to the combat vehicles. In this capacity the FTTS-MSV will serve as an active survivability, lethality, and support sensor node.

When "Pit Stop Design" and ACE are employed in the design of a system concept, the end product is a system concept that meets User requirements, and is easily operable and maintainable. Pit Stop Design identified actions to proceed toward a truly "World Class FTTS-MSV". Pit Stop Design is designing to win.

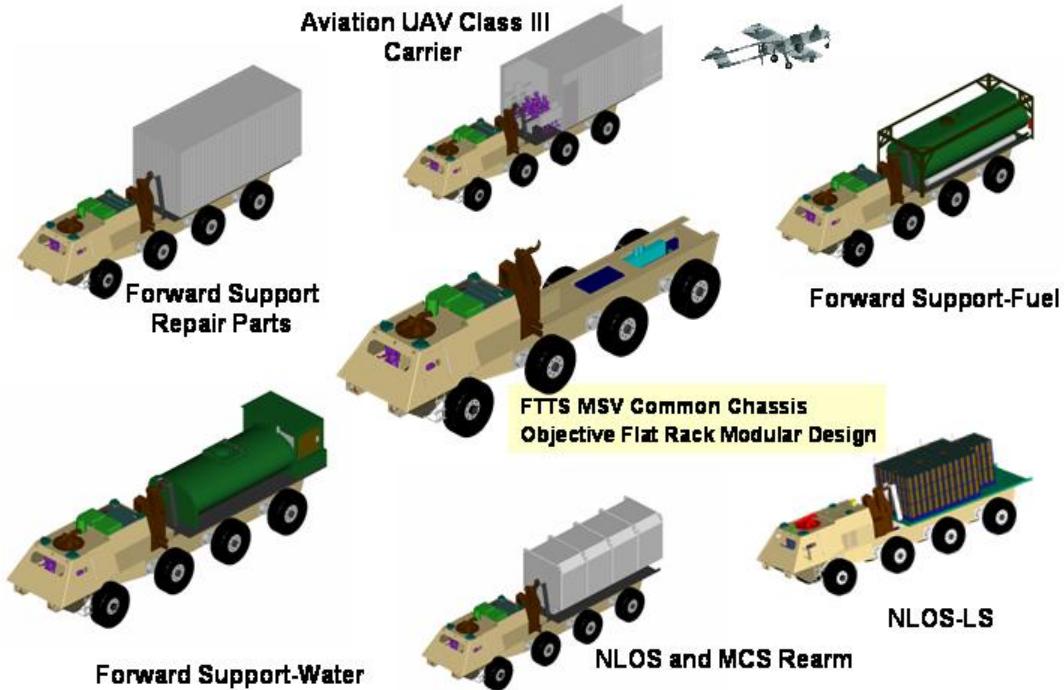
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Completed Pit Stop Design Model

## **Design Approach Reducing the Logistics Footprint**

### **Objective Flatrack based Unit of Action Modules**



**FTTS-MSV Concept with Pit Stop Improvements**